

A SURVEY OF RAPTORS ON RHODES: AN EXAMPLE OF HUMAN IMPACTS ON RAPTOR ABUNDANCE AND DISTRIBUTION

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The Dodecanese includes more than 200 relatively-undisturbed islands, only 27 of which are inhabited by people (de Grissac et al. 1994). Rhodes Island is a strategic area for bird conservation because it is close to important migration routes along the Turkish coast and may be a stopover for spring and autumn migrants. Because locations on the island have experienced varying degrees of human exploitation, it is also a place where the impacts of human activities on raptor populations can be evaluated. The aim of our research was to verify the impact of high levels of tourism on raptor abundance and to determine the effects of road building and settlements on raptor abundance. We hoped to provide documentation for the impacts of people on raptor abundance in the Mediterranean region, where raptors and people are frequently in conflict.

STUDY AREA AND METHODS

Rhodes is located in the southeastern part of the Aegean Sea, <20 km from the Turkish coast. The island is 80 km long and has a surface area of about 1400 km². There are four habitat types on the island: coniferous forest (*Cupressus sempervirens*, *Pinus brutia*, *Pinus halepensis*), maquis (*Arbutus andrachne*, *Erica arborea*, *Quercus coccifera*), phrygana (*Thymus capitatus*, *Erica manipuliflora*, *Sarcopoterium spinosum*, *Cistus* spp., *Lithodora hispidula*), and wetlands (de Grissac et al. 1994).

Based on previous surveys, we divided the island into two zones of human impact: the northern zone with high levels of habitat degradation caused by touristic exploitation, and by the presence of an electric power station, and the southwestern zone which is still not impacted by tourism. Ten survey routes, five in the northern zone and five in the southern zone, were selected and each route was surveyed in August for three years (1997–99). The routes were approximately 20 km in length and each route was treated as a line transect (Fuller and Mosher 1987) to estimate the relative abundance of each species of raptor. Carriage roads were driven at 20–40 km/hr during the morning (0730–1230 H) and afternoon (1500–1930 H), alternating the time period in order to not bias the data. Relative abundance indexes were computed (Woffinden and Murphy 1977) as follows:

$$\begin{aligned} \text{R.A.} = & [(\text{Number of species} \\ & \div \text{total individuals observed}) \\ & \div \text{Number of km traveled}] \times 1000 \end{aligned}$$

Data for the northern and southern zones were analyzed separately for each year using Mann-Whitney *U*-tests. A Kruskal-Wallis test was used to compare the mean number of each species of raptor observed in the two areas each year. All tests were two-tailed.

RESULTS

A total of eight species of raptors was observed. Four species, Eurasian Kestrel (*Falco tinnunculus*), Long-legged Buzzard (*Buteo rufinus*), Eurasian Buzzard (*Buteo buteo*), and Eurasian Sparrowhawk (*Accipiter nisus*) were residents of the island. Eleonora's Falcon (*Falco eleonora*) was a summer resident, and there were three migrants: Northern Hobby (*Falco subbuteo*), Merlin (*Falco columbarius*), and Booted Eagle (*Hieraaetus pennatus*). In all, 165 individuals were observed over the 600 km driven. In the northern zone, relative abundance estimates for raptors were similar (R.A. = 20) for all three years. The only raptors observed were Eurasian Kestrels (70.3%, *N* = 27) and Eurasian Buzzards (29.6%, *N* = 27). In the southern zone, eight species of raptors, Eurasian Kestrels, Eleonora's Falcons, Northern Hobbies, Merlins, Booted Eagles, Long-legged Buzzards, Eurasian Buzzards, and Eurasian Sparrowhawks, were observed (R.A. = 80). Kestrels and Eleonora's Falcons were the most frequently observed (R.A. = 180 and 150, respectively). Long-legged Buzzards were more common (R.A. = 100) than Eurasian Buzzards (R.A. = 76), and Eurasian Sparrowhawks were infrequently observed (R.A. = 20).

We detected a difference in the relative abundances of raptors between the northern and the southern zones in each year of our surveys (*U* = 0, *P* < 0.05), but no significant differences were detected in the number of raptor sightings between northern and southern portions of the island.

DISCUSSION

Our results indicated that the two zones of human impact on Rhodes have resulted in a differential distribution of raptors on the island. Only kestrels and buzzards, species that are highly adaptable to humans (Newton 1979), were observed in the northern part of the island where development has been the greatest. Those species were observed in the southern portion of the island are uncommon in areas with large amounts of human development. Southern portions of the island are not as at-

tractive for tourism because the rocky seashore is often inaccessible and the sea is always rough owing to dominant easterly winds. Nevertheless, there was two potential threats to the area's future suitability for raptors. The southern part of the island was increasingly being settled by people and there were projects designed to build new residences and several villages. Perhaps the greatest threat was a project to build a second electric power station on the island. The project would involve the destruction of 8 ha of native habitat along the coast where the majority of raptor sightings were made.

Because we observed so many migratory raptors during our surveys, Rhodes seems to play an important role in the migration of several raptor species. Rhodes is probably important because it offers undisturbed resting areas, water, and food resources. Due to this, future developments on the island should take into consideration the importance of native habitats on the island to migratory species of raptors.

RESUMEN.—En agosto desde 1997–99, censamos las aves rapaces en la Isla de Rodas para determinar los impactos de carreteras y construcciones asociadas al aumento de turismo en su abundancia. Hubo dos zonas diferentes de impacto, la zona norte con altos niveles de turismo y la zona sur con impacto relativamente poco de la gente. Diez rutas de investigación, cinco en cada zona de impacto fueron utilizadas. Un total de ocho especies de aves rapaces fueron observadas: Cuatro especies residentes *Falco tinnunculus*, *Buteo rufinus*, *Buteo buteo*, *Accipiter nisus*, un residente de verano *Falco eleonora* y tres migratorios

Falco subbuteo, *Falco columbarius* y *Hieraaetus pennatus*. Las especies ocurrieron en forma desigual con especies asociadas a la gente (*Falco tinnunculus* y *Buteo buteo*) mas frecuentemente observadas en la parte norte mas altamente impactada de la isla.

[Traducción de César Márquez]

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THE INCIDENCE OF INTESTINAL PARASITES IN BRITISH BIRDS OF PREY

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During studies on the comparative morphology of the digestive tract of British birds of prey, we examined the gut contents of 379 individuals of six raptor species. Methods of *postmortem* examination and the sources of these birds are given in Barton and Houston (1991, 1992,

1993a, 1993b, 1994, 1996). To obtain weights and measurements of empty digestive tracts, we removed the digesta from the whole gut by cutting the gut open along its entire length and carefully scraping out the gut contents, followed by washing. We took this opportunity to examine carefully the gut wall and gut contents for parasitic worms. We only recorded those clearly visible to the naked eye, and some species or microscopic individuals too small to be seen may have been missed. We counted the total number of worms removed from each individual. All those recovered were nematodes. This group of

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